ZONITID SNAILS (GASTROPODA: PULMONATA) INTRODUCED INTO VICTORIA

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Abstract

Five species of European zonitid snails are listed as having been introduced into Victoria, one as early as 1850. Two species, *Vitrea contracta* (Westerlund, 1873) and *Oxychilus draparnaldi* (Beck, 1837) are recorded from Australia for the first time. Three of the five species have become established.

Introduction

This paper reviews knowledge of introductions of zonitid snails into Victoria and assists field collectors to identify them. It is based on an examination of the collections in the National Museum of Victoria and on the writer's field work from August 1969 to the end of 1970.

The Zonitidae is a widespread family of pulmonate land snails, generally small to medium sized (2 to 20·0 mm diam.) with low-spired, thin, transparent to translucent shells, hiding under stones and litter by day, and eating non-green vegetable matter or small animals such as other snails and slugs. Several species have been introduced by European man into America, Africa and Australasia (Ellis 1951, pp. 193-195).

Five species of European Zonitidae have been identified as introductions: *Euconulus fulvus* (Müller, 1774), *Vitrea contracta* (Westerlund, 1873), and three species of *Oxychilus* (Fitzinger, 1833), viz. *O. cellarius* (Müller, 1774), *O. draparnaldi* (Beck, 1837) and *O. alliarius* (Miller, 1822). *Vitrea contracta* and *Oxychilus draparnaldi* are here recorded from Australia for the first time. In addition, *Zonitoides nitidus* (Müller, 1774) has been recorded (Musson 1890, p. 894 and Taylor 1914, p. 150) but the records are probably in error for *O. alliarius* which was erroneously recorded from N.S.W. and New Zealand (Taylor 1914, p. 66). *Z. nitidus* is an obligate hygrophile (Boycott 1934, p. 13) and therefore an unlikely candidate for successful introduction to Australia.

Identifications in this paper are based on shell characters and the external features of the animal when available. Where possible the descriptions are based on Victorian specimens; otherwise they are taken from Taylor (1914), Janus (1965) or Kuiper (1964, *V. contracta*). Zilch (1959, p. 277) has placed *Euconulus* in the family Euconulidae, but its inclusion in the Zonitidae by Ellis (1951) is adopted. Distributions outside Australia are taken from Ellis (1951) unless otherwise stated. The references given under each species cover (a) The original description and (b) The introduction into the various States of Australia.

Abbreviations:

H. = height, W. = width (diameter), WH. = number of whorls, NMV = National Museum of Victoria.

Key to Field Identification of Zonitids Introduced into Victoria

This key separates the various species from each other, and from other similar snails in the Victorian fauna.

Land snails with glossy, semi-transparent or translucent more or less smooth shell; animal with pedal groove defining the foot margin and capable of complete withdrawal into shell.

1. Shell turbinate 2
1. Shell depressed helicoid 3
2. Umbilicus present, W. under 4·0 mm *Laoma penolensis*
2. Umbilicus absent, W. under 3·0 mm *Euconulus fulvus*
3. Umbilicus present 4
3. Umbilicus absent, W. under 4·0 mm *Prolesophanta dyeri*
4. Shell W. under 4·0 mm 5

4. Shell W. over 4·0 mm 8
5. Shell whitish or colourless 6
5. Shell horn coloured 7
6. Umbilicus regular spiral .. *Vitrea contracta*
6. Umbilicus irregular spiral .. *Vitrea crystallina*
7. Aperture elongate ellipse, montane *Delos nelsonensis*
7. Aperture rounded ellipse, settled areas *juvenile Oxychilus?*
8. Shell yellowish or horn coloured 9
8. Shell greenish white, hyaline *Oxychilus alliarius* var. *viridula.*
9. Shell polished with faint growth lines, colour paler below 11
9. Shell striated above, smooth below 10
10. Regularly striated above to periphery *Strangesta*
10. Irregular striae and close spiral lines above *Echotrida strangeoides*
11. Shell horn coloured 12
11. Shell greyish yellow, animal with brown spots on mantle edge .. *Oxychilus cellarius*
12. Shell W. 10·0-14·0 mm, animal deep blue grey .. .. *O. draparnaldi*
12. Shell W. 4·0-7·0 mm, animal blue-black above, grey below, garlic odour. .. *O. alliarius*

Family Zonitidae

Zonitids have a simple aperture to the spirally coiled shell. The animal has the foot margin defined by a pedal groove which may form a caudal mucus gland. The marginal teeth of the radula are aculeate, and the jaw is oxygnathous. The ovotestis is usually imbedded in the liver (Taylor, 1914, p. 1).

Genus **Euconulus** (Reinhardt, 1883)

Euconulus fulvus (Müller, 1774)

Figures 1-3

Helix fulva Müller, 1774, *Verm. Hist.* 2: 249.

Hyalina (Euconulus) fulva, Müller. Gabriel, 1928, p. 133.

Description: Shell very small, glossy, turbinate, reddish brown, no umbilicus, semi-transparent, last whorl with a blunt peripheral keel. Animal grey-black. H. 2·0-2·3 mm, W. 2·5-3·0 mm, WH. 5-6 (Janus 1965, p. 112).

Distribution: Holaretic (Ellis 1951, p. 193). Introduced, Cann River, Victoria.

Material Examined: Two shells in NMV collected at Cann River by J. Clark in March 1928 (Gabriel 1928, p. 133).

Notes: Not to be confused with *Laoma penolensis* (Cox 1867), a native species, which is not glossy, has an umbilicus, and is common in coastal areas in Victoria.

Genus **Vitrea** (Fitzinger, 1833)

Vitrea contracta (Westerlund, 1873)

Figures 4-6

Zonites crystallina var. *contracta* Westerlund, 1873, Faun. Moll. Suec. p. 56.

Description: Shell very small, semi-transparent, milk-white (yellowish in life), spire depressed umbilicus small and regular, last whorl 0·3 larger than the penultimate. Animal greyish white.

H. 1·25 mm, W. 2·52 mm, WH. 4·5 (Kuiper 1964, p. 278).

H. 1·0 mm, W. 2·7 mm, WH. 4·5 (Geelong, Viet.).

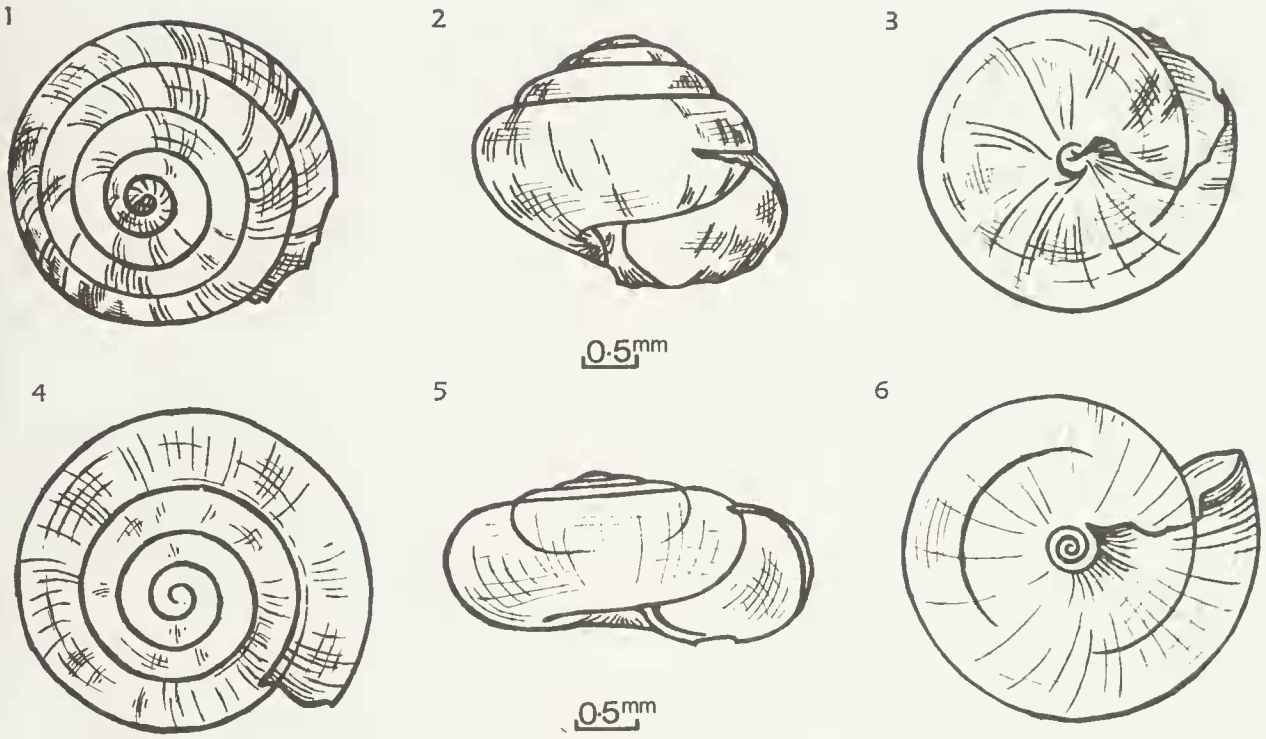
Distribution: Europe (Ellis 1951, p. 193). Introduced into Victoria and collected at Geelong.

Material Examined: Two shells in NMV collected in garden, Geelong, 15 Oct. 1967 by R. Burn, identified by Dr. M. P. Kerney (in lit.).

Notes: *V. contracta* is a new record for Australia, and is closely related to *V. crystallina* (Müller, 1774) which is recorded as introduced into 'S. Africa, New Zealand, Tasmania, etc.' (Ellis, 1951, p. 193). As *V. contracta* has been included in *V. crystallina* in the past (Taylor 1914, p. 113, etc.) some of these records may refer to *V. contracta*. *V. crystallina* is recorded as collected in gardens at Hobart by W. F. Petterd (Petterd and Hedley, 1909, p. 303).

Genus **Oxychilus** (Fitzinger, 1833)

Description: The three *Oxychilus* species identified in Victoria are small to medium sized snails with depressed spired, polished, semi-transparent shells of various shades of horn colour, paler below than above, and with a wide umbilicus.



Figs. 1-3—*Euconulus fulvus* (Müller), Cann River, Vict. Dorsal, lateral, and ventral views.
Figs. 4-6—*Vitrea contracta* (Westerlund) Geelong, Vict. Dorsal, lateral and ventral views.

NOTE: Live specimens are preferable for identification. Empty shells (especially if not fresh) may present difficulties, and so may preserved animals to a lesser extent, as some colours fade in alcohol and it is not always possible to get the animals fully relaxed.

Oxychilus cellarius (Müller, 1774)
(O. c. f. cellarius, Plate 10, figures 1-3)

Helix cellaria, Müller, 1774, *Verm. Hist.* 28 : 230.

Helix sydneyensis, Cox, 1864, p. 37.

Helix (Hyalina) sydneyensis, Cox. Legrand, 1871: 63.

Helix cellaria. Petterd, 1879, p. 96.

Zonites cellarius, Müller, 1774. Musson, 1890, p. 893.

DESCRIPTION: Shell medium sized, spire low, umbilicus 0·17-0·14 of shell diameter, colour greyish yellow and paler below than above, surface polished, growth lines faint, suture may appear channelled, aperture elliptical. Animal pale grey, foot nearly white, darker with a bluish grey tinge on the head and above the lateral line, mantle edge grey speckled with brown, spots vary from a stipple to well marked mottled but they may disappear in spirit specimens, mantle edge slightly yellowish compared with the body.

H. 5·0 mm, W. 10·0 mm, WH. 5-6 (Taylor 1914, pp. 31-32) but up to H. 4·0 mm, W. 9·0 mm, WH, 4-5 in Victoria, (Mt. Dandenong, 18 Oct. 1970).

DISTRIBUTION: Britain, Central Europe, W. Mediterranean; introduced to Scandinavia and Finland, N. America, S. Africa, Australia (N.S.W., Vict., Tasm.), New Zealand, etc. (Ellis 1951, p. 194).

MATERIAL EXAMINED: In NMV seven empty shells of *O. cf. cellarius* from S. Melbourne, coll. C. J. Gabriel, no date. Six living specimens from a garden, S. Camberwell, coll. Mrs. M. Turnbull with one *O. alliarius*, 27 Aug. 1970. One living specimen from a road verge, coll. D. C. Long, 5 Sept. 1970. Six living specimens from the base of grass tufts, road

verge, Mt. Dandenong, coll. D. C. Long, 18 Oct. 1970. Four living specimens and one dead shell near Mansfield school, coll. Sacred Heart College students, 9 Nov. 1970.

NOTES: Though there is no dated pre-1970 Victorian material in NMV, Musson (1890 p. 893) gives it from Melbourne on the authority of Kershaw, and Taylor verified specimens collected from Port Melbourne in October 1896 by J. H. Gatliff (Taylor 1914, p. 44). *Helix sydneyensis* Cox, 1864 has been identified as a synonym for *O. cellarius* (Cox 1909, p. 76), but following his original description Cox (1864, p. 37) remarked on differences of colouring and spire height between his specimens and *O. cellarius*. It would be useful to re-examine Cox's type specimens. One of the six *O. cellarius* collected at Mt. Dandenong on 18 Oct. 1970, laid eggs in the NMV on 21 Oct. 1970 (per Dr. B. J. Smith). The maximum shell size of these specimens is given above.

Oxychilus draparnaldi (Beck, 1837)
Pl. 10, figures 4-6

Helicella draparnaldi Beck, 1837, *Index Moll.* 6.

DESCRIPTION: Shell medium sized, polished with a slightly raised conical spire, last whorl slightly dilated at the aperture, twice as broad as the penultimate whorl, aperture elliptical (more elongate than *O. cellarius* and *O. alliarius*), whorls with irregular growth lines (more prominent than *O. cellarius* and *O. alliarius*), colour pale to dark horn and paler below, umbilicus about 0·13 of shell diameter. Animal blue-grey, including the foot of which the central zone is paler, mantle edge dark grey and unspotted, appears dark through the shell.

H. 6·0 mm, W. 15·0 mm, WH. up to 7 (Taylor 1914, p. 20) up to H. 6·0 mm, W. 13·0 mm, WH. 6 in Victoria (Murrumbeena 28 Apr. 1970).

DISTRIBUTION: Europe (introduced in N.), British Isles but mostly in S. and W., introduced in N. America and S. Africa (Ellis 1951, p. 194), Morocco, Algeria, W. Asia (Taylor 1914, p. 29).

Introduced into Victoria; coll. various Melbourne suburbs out to Mt. Dandenong, and possibly Mansfield.

MATERIAL EXAMINED: In NMV 24 collections from 22 localities in the Melbourne area, one possible coll. near Mansfield School by Sacred Heart College students, 9 Nov. 1970.

NOTES: This species has not been previously recorded from Australia. Specimens in the NMV collected prior to 1970 were all identified as *O. cellarius*. *O. draparnaldi* seems to be especially frequent in the outer suburbs of Melbourne. The earliest dated NMV shell was collected by 'J.D.' at Richmond in 1902. Three undated specimens were collected by C. J. Gabriel in his glasshouse at Abbotsford and six undated specimens from his fernery. Four dead shells were found with two living specimens (now in NMV) at Beaumaris on 28 Mar. 1970 by the writer, and sent to Dr. M. P. Kerney who commented 'The *Oxychilus* you send look to me exactly like *O. draparnaldi*' (in lit. 14 Apr. 1970). Taylor (1914, p. 22) states that each row of the radula of British specimens of *O. draparnaldi* typically has three tricuspid lateral denticles on either side of the median tooth, though some continental writers give the number as two to four. Dr. B. J. Smith prepared the radulae of two snails, one from Ivanhoe (coll. Gunner, 11 May 1970), and one from Greensborough (coll. G. Robertson 4 July, 1970). Both these radulae have two tricuspid lateral denticles per row. Some caution is therefore necessary about the identity of this introduced snail, even though its external features are in close agreement with *O. draparnaldi*. One possibility is that there are regional variants of *O. draparnaldi* and that the Victorian introductions are not from a British source. More radulae need to be examined.

Oxychilus alliarius (Miller, 1822)
Pl. 10, fig. 7-9

Helix alliaria Miller, 1822, Ann. Phil. N.S. 3: 379.
Zonites nitidus Müller, 1774, Musson 1890, p. 893.
Zonitoides nitidus Müller, Gabriel 1930, p. 187.
Zonitoides nitidus (Müller) 1774, Cotton 1954, p. 183.
Oxychilus alliarius (Miller) 1822, Cotton 1954, p. 183.
Oxychilus alliarius (Miller), Laws 1966, pp. 257-260.

DESCRIPTION: Shell similar in shape but smaller than the preceding two species, horn coloured, slightly paler round the umbilicus, glossy with regular week striations, convex above, flattened below, umbilicus 0·17 of shell width, aperture slightly elliptical (rounder in outline than *O. cellarius* and *O. draparnaldi),* spire slightly higher than *O. cellarius*. Animal slaty blue-black on head and above lateral groove, grey below groove, paling towards the foot which is grey, mantle edge grey, appears thinly edged dark grey through the shell.

H. 2·5 mm, W. 5·0-6·0 mm, WH. 4-4·5 (Taylor 1914, p. 59) up to H. 2·5 mm, W. 7·5 mm, WH. 5 in Victoria, waste ground, Oakleigh 5 July 1970).

DISTRIBUTION: Britain, Europe (Iceland, Scandinavia, Estonia to France and Poland), introduced into N. America, St. Helena, S. Africa, Juan Fernandez, Australia, and New Zealand (Ellis 1951, p. 194). Introduced into N.S.W., S. Australia, and Vict. where widespread. Common around Melbourne. Extremes are Hamilton (undated), Irymple (*O.* cf. *alliarius,* 1970), Bairnsdale (undated), and Rutherglen (*O.* cf. *alliarius,* 1954).

MATERIAL EXAMINED: In NMV numerous dead shells and preserved animals from 26 localities in Victoria.

NOTES: *O. alliarius* has not been formally recorded from Victoria before, though it is the most widespread introduced zonitid in Victoria and apparently the earliest introduced. Seven shells of this species from the R. A. Bastow Collection in NMV are labelled '*Zonites alliarius* Mull. 1850 Fitzroy Gardens' an ascription apparently overlooked for the last 120 years. The snail has been found mainly in gardens, under dwellings, and in cleared land, but there are two records of it in open sclerophyll forest with a mixed native and introduced mollusc fauna at Linton, 23 Nov. 1969 (Long 1970, p. 171). and "under stones in open forest," N. Ringwood, coll. B. Fuhrer 22 June, 1970.

O. alliarius emits a smell of garlic on withdrawing into its shell when alarmed, and when crushed alive, a feature not shared by *O. cellarius* and *O. draparnaldi,* hence the specific name (Latin : allium = garlic) and the vernacular Garlic Snail. A variety with a greenish white shell (var. *viridula* Jeffreys, 1862) has been found in a garden at Oakleigh by the writer (Sept. 1969 - Apr. 1971). Laws (1966) noted differences between the first and second radula teeth and the spermatheca of S. Australian *O. alliarius* and the material described by Taylor (1914) and commented that the S. Australian introduction may be from a source outside the British Isles. The relative roundness of the shell aperture may be the cause of earlier mis-identifications of this species in Australia as *Z. nitidus.*

Discussion

The identification of introduced Zonitidae, especially *Oxychilus* spp., requires caution. Cox (1864) and Laws (1966) have remarked on differences between the specimens they examined and the descriptions available for European (mostly British) material. Externally the three *Oxychilus* spp. identified in Victoria resemble specimens of those species encountered by the writer in the course of local recording for the Conchological Society of Gt. Britain and Ireland's Census of Non-marine Mollusca in Britain from 1966 to 1969, but the apparent radula difference in *O. draparnaldi* has already been noted, and the maximum size of *O. alliarius* exceeds that published elsewhere (Taylor 1914, Janus 1965). Whether this is because the species encounters optimum conditions here or because the published dimensions are taken from a small sample is unknown. Evidence exists for suspecting that some of the Victorian introductions of *Oxychilus* are not from Britain but from mainland Europe, possibly the Mediterranean, though little is known of regional variation of *Oxychilus* spp. in Europe.

Field observations have so far indicated that the habits of *Oxychilus* in Victoria are similar to those of the genus in Britain. Most collections of *Oxychilus* in Victoria have been of one species, but all three were found by the writer within 200 m of each other at Mt. Dandenong on 18 Oct. 1970. Fifteen of the 72 collections of *Oxychilus* examined were not

fully identifiable, mostly because of poor or insufficient material, but in at least two cases species other than the three identified may be involved. Three living specimens were collected at Redcliffs on 1 Jan. 1970 by A. Borlace, and one dead shell, Mt. Buffalo Chalet, altitude 1,370 m, 14 Feb. 1970, coll. writer.

Little can be said about the introductions of *E. fulvus* and *V. contracta*. They do not appear to be widespread, though both being small could easily be overlooked. The dimensions of the Victorian *V. contracta* are larger than those given by Kuiper (1964, p. 278). In Feb. 1971 a brief search of the strawberry bed where *V. contracta* had been found in 1967 failed to produce any specimens.

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Explanation of Plate 10

Figs. 1-3—*Oxychilus cf. cellarius* (Müller), S. Melbourne, Vict. The spire is higher than typical *O. cellarius.*

Figs. 4-6—*O. draparnaldi* (Beck), Abbotsford, Vict. from C. J. Gabriel's glasshouse. Note typical dilation of last whorl.

Figs. 7-9—*O. alliarius* (Miller), Kew, Vict. 10 June 1941.